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Photographic Notes No. VII.

Coloring of Lantern Slides.

It may be useful for those who have no camera at hand to know a simple way of making, photographically, slides of diagrams, formulas or anything that may be set down in a comparatively small space with the aid of pen and ink.

Place a No. 1 mat (opening about 3 inches square) on a piece of clean white bond or eggshell paper, same size as full mat. Trace lightly in pencil the opening of the mat and in this space draw in good black ink (Higgin's) the diagram to be reproduced. When the ink is on, rub out the pencil marks, place the drawing face up on the glass of the printing frame, and in the dark room, set on it a lantern plate, sensitive side down. Clamp the back and expose to the lamp light. On developing the diagram will appear clean cut and clear on a black ground. This may be used as a slide with "chalk and blackboard" effect. Or when it has dried, expose it as a negative the same way and the lines will come out perfectly black and defined on a clear background.

Now we come to the slide coloring. This may be very simple, a few lines to mark divisions on a map or to call attention to some word on the slide. One would naturally select a pen for this work, but without a very delicate touch and great care the slide may be ruined.

It is better to use a fine brush, whose point is much less rigid than the pen point and which will, with a little practise, give just as fine a line without the danger of cutting the film. A few words then about the brushes, colors and their application. Since few brushes are needed and since they will last a long time, buy the best. One will need at least two each of Winsor & Newton's numbers 0, 1 and 2 sable brushes; the larger ones (for broad work) corresponding to number 6 of the aristocratic type may be camels hair, or more commonly squirrel's hair, or any even cheap brush that does not shed its locks. Don't take brushes with quill handles or oil-color brushes for ordinary slide coloring; the stiff bristles would cut the film. It will be more economical, though not neat, not to clean the brushes after use; leave them to dry with a load of color and clean them only just before the next using. The moth larvae will eat of the tips of a clean brush and with the tip gone the brush is useless. The colors, water-soluble and transparent are all coal-tar derivatives, sold as Egyptian, Japanese, Miracle, etc. The Eastman Co. offers a good collection in book form and these may be supplemented by a few "stains" e.g., Safranine, Congo Red, Bismarck Brown, Gentian Violet. Most red inks are different Eosine solutions, of good tint, but some of them will soften the gelatine and ruin the slide.

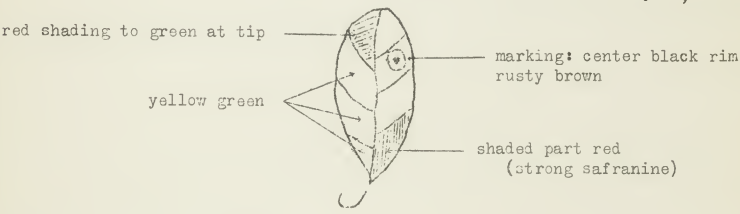
The slide best adapted to color should be soft, clear, with detail in the shadows, not harsh. Prepare the stand and magnifying glass already described in the notes on "retouching and blocking out", and on its upper right hand corner fasten a piece of filter paper (to take off excess color from the brush). Have a tumbler of water, on the right hand side (supposing the colorist to be "dexterous") and a china color tray with 8 Or 10 cavities and a cover. The makers of the color books advise the beginner to cut off a piece of the color sheet and put it in a little water, moving it about until the color is dissolved. The better way is to have some water in the cavities, wet the brush and remove some color from the sheet and stir it in the water, repeating the process till the desired strength is obtained. What is not used will dry up and the residue is merely wetted and used again with very little loss. Some of the colors must be handled with care. Don't use Methyl Green, it fades too quickly; Congo Red may be applied strong for lines, but not for surfaces, it smears. Some yellows and greens give blotchy effects if concentrated solutions be used, but the "meanest" colors to manipulate are the violets, Methyl and Gentian; always begin with a weak solution and go over the surface again and again and continue with patience remembering not to work a surface too long while it is wet and try not to do any coloring on a hot damp day.

Areas should be colored fully to the edge and not over, or the work will be too sloppy to stand much screen enlargement. And when the slide is colored and bound up, keep in mind the fact that most of the coal tar colors, especially the more brilliant ones, will hold their tones longer in the dark; so do not leave laboriously colored slides lying about uncovered to be bleached by direct or diffused sunlight.

Color Record -- If a "biological" slide is to be tinted, the colors to be chosen should be imitative not decorative. Practically all specimens, moths, butterflies, larvae, leaves, flowers, lose much of their color after collection and if the slide is not made soon and with the specimen, unchanged and near by, the results will often be "imaginary". Unless one has an exceptional color memory not merely for the basic color, but also for tints, a record of the colors and their location should be kept for reference. As soon as a negative is made and dried write on the margin (gelatine side) in ink the date, title etc., for example "Sour Gum Leaf, Oct. 30,,27 see Color Book page 17".

In the color book, an ordinary note-book (7 inches by 9 inches) used for this purpose only make a "topographical" sketch of the subject, same point of view as the negative, and add notes; for example on page 17

Sour Gum - Oct. 30, 1927.



The name of the color, Safranine, Bismarck Brown etc. may help to suggest the exact shade of red or brown. In some cases it may be necessary to place a small "dash" on the correct tint in the color book on the sketch. With the aid of these color notes the slide may be finished at leisure, though the best results are to be gained when the object is resting near the coloring stand during the process.

In one of the preceding notes we suggested the use of dark backgrounds for some subjects. If, for example, we wish to photograph a white flower we should use a gray ground which would show well both flower and leaves. If the flower have large petals (magnolia) the shades in the petals are grayish and are lost by want of contrast with the ground. The slide will be much improved by tinting not only flower and leaves but also the background. Select a color that harmonizes with the subject's tints but is not found in it.

Good background colors, those that cover easily are safranine, some eosines, flesh color, yellow, orange and some greens. Using a small brush work in the ground color as close as possible to the outline of the subject and then with the large brush fill in the rest rapidly. In all cases use dilute solutions and the required strength may be moreeasily and uniformly attained by successive applications than by one "dose" of a strong color and besides the ground should not be prominent in color.

One should avoid "hygroscopic" mats especially for colored slides. This kind of mat is made from smooth, dead black, (not glossy) paper quite thin and limp to the feel. When the grades of plates were spoken of in connection with the "reproduction" of natural objects the Seed 26 plate was mentioned as being very good. It may be worth knowing that the Seed 26 and 30 are exactly the same, (same speed, same emulsion and made by the same firm), as the Eastman 36 and 40. The Eastman plate is carried by more dealers than the Seed.

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THE APPLICATION OF PARAMETERS TO THE PARABOLA.

A Parameter may be defined as a variable by which the coordinates of a point may be expressed. From the following it may be seen how easily many of the problems connected with the parabola may be solved by the use of parametric equations.

1) The equation of the parabola whose vertex is at the origin and axis coincident with the x - axis is $y^2 = 4px$, or, if $p = 1$, $y^2 = 4x$. This can be expresse in terms of the parameter (t),

$$x = t^2$$

$$y = 2t$$

for, squaring, $y^2 = 4t^2 = 4x$.

2) A tangent to a parabola is

$$x = t_1 t$$

$$y = t_1 + t$$

This is evident, for when $t_1 = t$, you have the equation of the parabola.

3) At times it is useful to express the tangent in what we may call the mixed-form. This is done by eliminating t.

$$t = \frac{x}{t_1} \qquad y = t_1 + \frac{x}{t_1}$$

$$\text{or, } x - t_1 y + t_1^2 = 0$$

4) This might have been obtained from the slope form of the equation.

$y = mx + 1/m$, therefore $dy/dx = m$.

$$dy/dt = d(t_1 + t)/dt = dy/dt = 1$$

$$dx/dt = d(t_1 + t)/dt = dx/dt = t_1$$

therefore $dy/dx = 1/t_1 = m$

therefore $y = x/t_1 + t_1$, or, $x - t_1 y + t_1^2 = 0$

5) Or we might have used the point equation to obtain the chord and then the tangent.

$$(y - y_1)/(x - x_1) = (y_2 - y_1)/(x_2 - x_1)$$

substituting $(y - 2t_1)/(x - t_1^2) = 2(t_2 - t_1)/(t_2^2 - t_1^2) = 2/(t_2 + t_1)$

therefore $y(t_2 + t_1) - 2t_1 t_2 - 2t_1^2 = 2x - 2t_1^2$

$2x - y(t_2 + t_1) + 2t_1 t_2 = 0$, which is the equation of a chord,

When $t_2 = t_1$, $x - t_1 y + t_1^2 = 0$

6) The coordinates of intersection of two curves are

$$x = t_1 t_2 \quad \text{and } y = t_1 + t_2$$

Proof:- One tangent is $x - t_1y + t_1^2 = 0$

The second is $x - t_2y + t_2^2 = 0$

Subtracting $(t_2 - t_1)y = t_2^2 - t_1^2$

Therefore $y = t_2 + t_1$

$x = t_1 t_2$

7) Two lines are perpendicular when $m_1m_2 = -1$. The product of the slopes of the two tangents to a parabola is

$$1/t_1 . 1/t_2 = 1/t_1t_2$$

Therefore $1/t_1t_2 = -1$ and $t_2t_1 = -1$. Hence the intersection of two perpendicular tangents lies on the directrix. Hence--The locus of two moving perpendicular tangents to a parabola is the directrix.

8) As we saw, a chord is

$$2x - (t_1 + t_2)y + 2t_1t_2 = 0$$

If the chord passes through the focus (1,0),

$$2 + 2t_1t_2 = 0, \text{ and } t_1t_2 = -1$$

but t_1t_2 is the intersection of two tangents at the end of chord. Therefore, the chord of contact of two perpendicular tangents is a focal chord, or, tangents at the extremities of a focal chord are perpendicular and meet on the directrix.

9) A tangent is $x - t_1y + t_1^2 = 0$. The intercept on x, $y = 0$, $x = -t_1^2$, but a point of tangency $x = t_1^2$. Therefore the subtangent is bisected at the origin.

10) If $x = 0$, $y = t_1$, but the ordinate of the curve is $2t_1$. Therefore the tangent cuts the axis at 1/2 the point of tangency.

11) $x - t_1y + t_1^2 = 0$

The equation of normal is $t_1x + y = t_1^3 + 2t_1$

Proof:- $t_1x + y = k \quad x = t_1^2 \quad y = 2t_1$

Therefore $t_1^3 + 2t_1 = k$

" $t_1x + y = t_1^3 + 2t_1$

12) The intercept on x, $y = 0$,

$$t_1 x = t_1^3 + 2t_1$$

$$x = t_1^2 + 2$$

but subnormal equals the x - intercept minus the abscissa of point of tangency. Therefore subnormal $= t_1^2 + 2 - t_1^2 = 2$, therefore a constant and equal to the distance from the focus to the directrix.

13) The envelope of a tangent.

$$x - ty + t^2 = 0$$

$$- ydt + 2tdt = 0$$

$$- y = - 2t$$

$$y = 2t \text{ and } x = t^2, \text{ a parabola.}$$

14) Envelope of a normal.

The equation of normal is

$$tx + y = t^3 + 2t$$

$$t(x - 2) + y - t^3 = 0$$

$$(x - 2)dt = 3t^2 dt$$

$$t = \pm\sqrt{(x - 2)/3}$$

Substituting $\pm \sqrt{(x - 2)/3}$ $(x - 2) + y - (x - 2)/3 \cdot \sqrt{(x - 2)/3}$

Therefore $y^2 = 4/27 \cdot (x - 2)^3$ --- semicubical parabola.

15) Cf. Wentworth, page 126, #35.

Find the locus of the middle points of all focal radii.

Coordinates $1,0 \quad t_1^2, 2t_1$

Middle point $2x = t_1^2 + 1$

$$2y = 2t_1$$

$$y = t_1 \qquad t_1^2 = y^2$$

Therefore $y^2 = 2x - 1$

16) Find middle points of all ordinates.

$$x = t^2 \qquad y = t$$

$y^2 = x$, locus is a parabola.

17) Example 36.

Find middle points of all focal chords.

$$2x = t_1^2 + t_2^2$$

$$2y = 2(t_1 + t_2)$$

$$y = t_1 + t_2$$

$$y^2 = t_1^2 + 2t_1t_2 + t_2^2 \quad \text{sub. } t_1^2 + t_2^2 = 2x,\ t_1t_2 = -1$$

$$y^2 = 2x - 2$$

18) Two tangents to a parabola $y^2 = 4x$ make angles θ and θ' with the axis of x. Find the locus of intersection

a) if $\cot \theta + \cot \theta' = k$.

$$\tan \theta_1 = m_1$$

$$\cot \theta_1 = 1/m_1 = t_1 \qquad \text{therefore } t_1 + t_2 = k$$

$$\cot \theta_2 = 1/m_2 = t_2 \qquad \text{" } \quad y = k, \text{ a straight line}$$

parallel to x - axis.

b) if $\cot \theta - \cot \theta' = k$

$$t_1 - t_2 = k$$

$$t_1^2 + 2t_1t_2 + t_2^2 - 4t_1t_2 = k^2$$

$$(t_1 + t_2)^2 - 4t_1t_2 = k^2$$

$$y^2 = 4x + k^2$$

c) if $\tan \theta_1 \cdot \tan \theta_2 = k$.

$$1/t_1t_2 = k$$

therefore $\quad kx - 1 = 0.$

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A BRIEF DESCRIPTION OF TYPHOONS.

Winds have often been used to typify that which is free, unrestrained, unsubdued. Even though some predictions of weather forecasters give foundation for this use, it is now conceded that winds are guided by laws of nature, the application of which, however, is not entirely clear. It is to the credit of Fr. Jose Algue, S. J., formerly director of the Weather Bureau of the Philippine Islands, that many laws governing the terrible storms found in that region are known and explained. Father Algue's researches into the nature and behaviour of these storms, called "baguios" and "typhoons" in that region, were given to the public by the publication of "The Cyclones of the Far East", an extensive treatment of the subject. In this article, the writer has gathered together a few ideas from Father Algue's book for the benefit of the readers of the Science Bulletin.

"Typhoon", "Baguio", "Hurricane" are words signifying the same type of storm found in tropical waters. The first two names are to found in the languages of the Far East, the last in the West Indies. In the "Acts of the Apostles", XXVII - 14, there is mentioned a "ventus typhonicus", but it is difficult to determine if this storm was a real circulatory cyclone or not. In Pliny, "De Repentinis Flatibus", (book 2, chap. XLVIII) and in Aristotle, "Meteor" (book 3), there is foundation for the belief that the Greeks used the word typhoon to signify a strong wind. (Cf. Algue, Cyclones of the Far East, 2d revised edition, 1904, page 11. note 1).

Father Algue defines a typhoon as "a vast whirl of aerial currents which surround a central space of calm, relatively small, called the 'vortex' or 'center' of the storm" (Algue, loc. cit. page 11). We will consider the two parts of this definition, namely the whirl of aerial currents and the vortex. Figure I is a diagram of the horizontal cross-section of an ideal (inasmuch as it is circular, the usual shape being more or less elliptical) typhoon. Figure II represents a vertical section. With the help of these diagrams, it will not be difficult to understand a few phenomena connected with these storms.

"A vast whirl of aerial currents" is mildly represented in the lower part of Fig. I. The typhoon as a whole moves (motion of translation) in the direction A' - B' and the time taken to pass one point can be realized by the time scale at the top of the diagram. A barograph curve, recorded at Manila Observatory when a typhoon passed over the city, is given below the time scale. The storm is here represented as circular, though the usual form is elliptical to a greater or less degree. The center or vortex is often displaced from the geometrical center of the whirl, but for simplicity, it is here represented as shown. The winds move counter-clockwise around the center. This kind of rotary motion is found in cyclonic motion of the northern hemisphere, whereas the reverse is true in the southern hemisphere. The explanation of this phenomenon was first given by Prof. William Ferrel, a teacher in Nashville, Tenn. In 1856, his attention was drawn to the above phenomenon and others which led to an investigation and finally an explanation. His theory, in brief, was that the rotation of the earth deflected the winds as they moved along the barometric gradient and this deflective force resulted in a rotary movement around the center. His mathematical development of the movement of air on a uniform sphere gavemeteorology a foundation for future investigation, and this development may be found briefly synopsized in "A Popular Treatise on the Winds", by Ferrel. When allowance is made for friction and irregularities found on the surface of the earth, Ferrel's conclusions are verified. This whirl of wind, rotating counter-clockwise, is divided, according to convention, into four quadrants, as indicated in the diagram. This is the ordinary and most used division, and, in Fr. Algue's book there are many directions for captains who find themselves in a typhoon. Quadrant I is the most dangerous, because the wind tends to blow the ship directly into the path of the vortex. If the ship has not enough power to make headway against these winds, or if it is a sailing vessel, the utmost skill will be required to survive the storm if the vessel is caught in the first quadrant. The violent winds of course are due to the low pressure of the atmosphere.

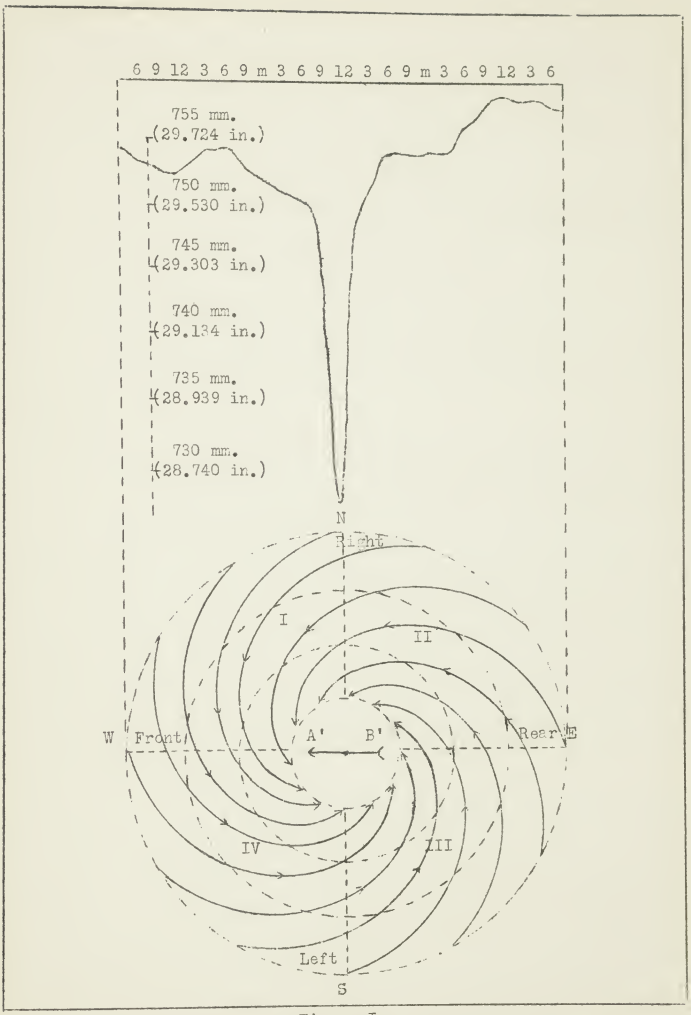

Figure I

Adapted from Plate I, page 10, "Cyclones of the Far East."

(A brief description of Typhoons.)

The closer one gets to the center, the lower the barometer falls, and the more intence the winds become. On the outer edge of the storm, the lowering of the barometer and its effect on the diurnal maxima and minima of a station's record, give certitude of an approaching typhoon. In the tropics, the barometer acts on an ordinar day in a very regular way, comparing its movement in higher latitudes during a twenty four hour period. An approaching typhoon interferes with this regularity, giving clea signs to an experienced man, of the coming storm. In the curve of Fig. I some of the irregularities near the ends are due to the diurnal maximum and minimum of the day The diameters of typhoons vary, some being as small as fifty miles. On the barometer dial of the barocyclonometer, Fr. Algue gives the outer limit of the possible effect of barometric pressure, due to the typhoon, as one hundred and twenty miles to five hundred miles away from the center, thus enabling one to assume that he know of a typhoon one thousand miles in diameter. In all typhoons, there is an immense mass of air in motion and it is by no means certain what the proximate causes are which give so much energy, sufficient to keep the storm in existance for days at a time. That solar energy is the ultimate cause, is generally admitted by all, yet the (intermediate method of transferring the energy is a matter of speculation. One theory explains the source of this energy by means of the latent heat envolved when the vast quantities of vapor are condensed to rain. Enormous as it is, yet it does not seem to be sufficient to account for all the energy required. This, however, is but one problem connected with the study of typhoons. In Fig. II there are others indicated, which we will now consider.

Fig. II is a vertical section of a representative typhoon and indicates other movements connected with the storm. The typhoon is considered as moving in the direction of the arrow N - M. EO is the axis, that is, an imaginary line perpendicular to the surface of the earth and around which the rotary motion of the winds take place. The heavy lines show how the winds, cloud laden of course, move in and then rise through the "bar" of the typhoon to the upper regions, where the moisture they hold condenses and forms cirrus clouds. These cirrus clouds are dependable signs of an approaching typhoon for a experienced observer, but accuracy is obtained only after years of experience. Fr. Algue gives on page 14 of his book a quotation from "Handbook of Cyclonic Storms in the Bay of Bengal" (written by Mr. Eliot, formerly in the weather bureau of India) which quotation is a good description of the "bar" of the typhoon. "When a cyclonic storm has formed," says Eliot, "large masses of air are carried rapidly upward in the body of the cyclone or over a considerable portion of the inner storm area. The aqueous vapor with which it is laden is in part condensed rapidly. Huge nimbus, pallium, or rain clouds are formed, from which rain is poured down in torrents. Hence over the central area there is a permanent, dense, black mass of clouds which moves with,and is a part, of the cyclone. This permanent state is, of course, one of appearance only.

The air as it rises up and passes through the cloud-charged space has a portion of its aqueous vapor condensed, and thus contributes or adds to the mass of the cloud, whilst at the same time the cloud is continually losing a portion of its mass by the rainfall. The cloud mass is hence in a state of constant growth and decay. Its appearance at a distance is that of a huge bank of clouds resting on the horizon, which retains its form unchanged for hours. It is usually most conspicuous about sunrise and sunset. If a ship should travel at about the same rate as the cyclone this huge bank of clouds may be observed for several days in succession." Such is a typhoon viewed from a distance. When it approaches a definite location, and the wind direction remains the same, one can be sure that the center or vortex will pass over that place. As the barometer drops and the center gets nearer and nearer, the winds increase to a destructive velocity, almost always over sixty miles an hour and often reaching one hundred and twenty miles an hour. These winds come sometimes in terrible gusts, which are most destructive. These gusts required an explanation and the commonly accepted one is the nutation of the axis OE. In Fig. II,OE' is the axis of the typhoon in its new position and the dotted lines show the course of the winds and the new position of the bar of the typhoon.

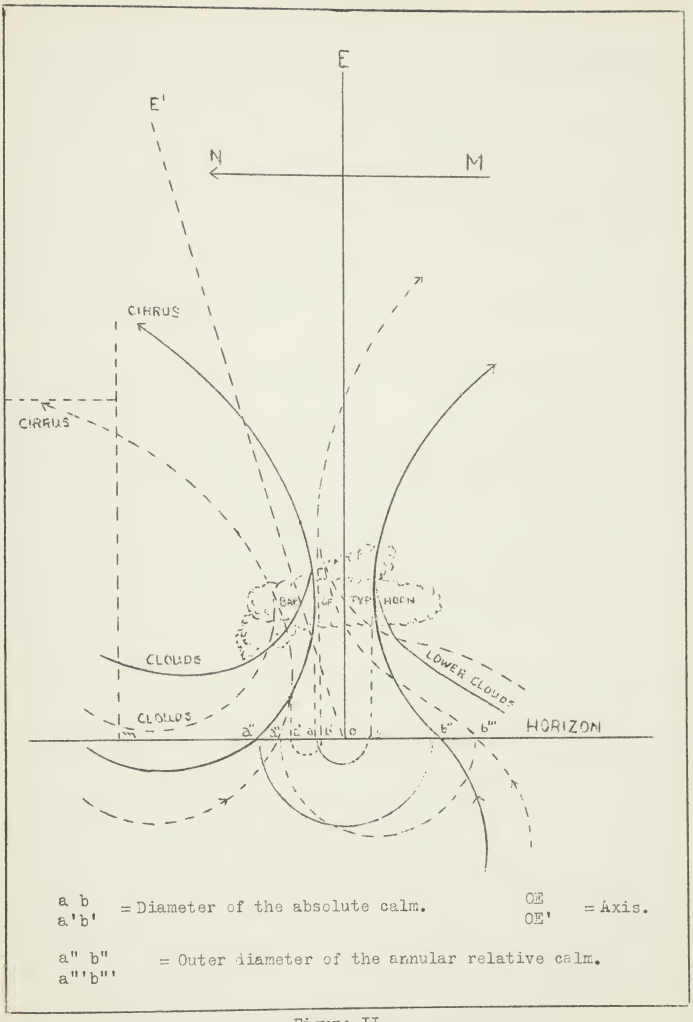

Figure II
Plate II, page 14,"Cyclones of the Far East".

(A brief description of Typhoons.)

In the words of Fr. Algue, page 14, "The two large, ascending spirals, one of which has a convergent, the other a divergent, movement as regards the center, inclose the axis of the typhoon. Plate II (Fig. II of this article) gives a vertical section through a cyclone in which the axis has two directions - OE and OE'. These two directions of the axis indicate to us a nutation, which may influence the violenc of the wind and possibly the whole cyclone. Redfield ascribes to the nutation of the 'gyral axis' the great variety in the force of the wind at equal distances from the center, and likewise the squally nature of the strong winds. If the axis is vertical the annular relative calm and the central absolute calm are confined within regular limits. If the axis, however, assumes the inclination OE', and if the cyclone is advancing in the direction of the arrow MN, the zone of relative calm disappears almost entirely in the front, but grows correspondingly larger in the rear. If by this direction of the axis the area absolute calm should become smaller the clouds and winds in the front will be at the same time lower, and the latter will consequently be much more violent than in the rear and the cirri will stream out in front at a lower altitude. If we take for the same direction of the axis the progressive movement of the cyclone to be in the direction NM, the contrary of what has just been said will take place.

If the axis should incline toward one of the sides the 'manageable' and 'unmanageable' semicircles may be interchanged, as is easily understood. Hence it is clear how great an influence the position of the axis exercises upon the elements constituting a hurricane, but above all that, supposing the oscillatory movement of the cyclone's body, it is a perilous idea to consider the dangerous and safe semicircles as occupying fixed positions. However, in that part of the tropical zone which comprises the Philippine Archipelago the progressive movement of the cyclone is not very great in comparison to the gyratory motion. Hence the component due to the advance of the storm is not sufficiently great to have much of an influence upon the velocity of the wind and upon the other elements of the phenomenon. Consequently the difference between the 'manageable' and 'unmanageable' semicircles is not so pronounced as some meteorologists suppose it to be." Much of this quotation is not necessary for the purpose of this article but it is included to show the manner in which Fr. Algue treats his subject. "Manageable" and "unmanageable semicircles will be understood from Fig. I.

Quadrants I and II form the "unmanageable semicircle because the translatory motion of the typhoon forms a component which makes the winds of this quadrant more violent. The "manageable semicircle consequently has winds of less violence. For the reasons given in the above quotation, such a classification is not usually accepted. In fact, a captain within any part of the typhoon expects violent winds and prepares for them and if they do not come, so much the better. After the calm area passes over a place, the winds blow with all their violence but from the opposite direction. Houses, especially small huts such as are found in the Philippine Islands, often have to be propped up with poles to keep them from being blown over. When the calm comes, the men hurry and move the props around to the opposite side of the house in order that the winds, soon to come in the reverse direction, will not entirely destroy the property. In the destructive hurricane which passed over Miami within the last two years, many people lost their lives by coming out into the streets during the calm and then getting caught by the winds which blew fragments of steel roofing and such around the streets. Fig. I clearly shows how the winds blow in the reverse direction after the calm area passes. Thus far we have considered phenomena surrounding the calm area and now there remains that most interesting part of the typhoon to study.

To those who experience it for the first time, the calm area while passing over a place, is remarkable for its contrasts. The violent winds die out, the clouds disappear, and the sun shines or at night, the stars are visible. On the ocean the waves within the calm area are terrible. Close at hand, from all directions, the winds are driving heavy mountainous waves into the calm area from all directions. As one officer of a ship explained to the writer,

"We do not mind large waves if they come slowly enough for the ship to ride them. But when a wave comes along and tries to lift the bow just as it has been depressed by another wave, then there is a strain on the ship. After this has been repeated, as it happens in the center of the typhoon, the ship loses something that can never be replaced." Birds, sometimes land birds even when a long distance from land, appear and come to the boat to rest. They have been helplessly blown in by the winds. Butterflies, too, have been seen in the center of the typhoon. One interesting case is given in Fr. Algue's book (page 57); the sun's disk was veiled by the clouds so that a dozen stars could be seen above, even though the sun's disk was partly visible. These few phenomena give an idea of what happens in the "eye of the storm" as the center is sometimes called. There are, however other scientific phenomena of interest and these we will consider in the following paragraph.

In the center, the lowest barometric pressure is found as a rule. I give here some interesting barometric minima recorded in the Pacific Ocean. These are taken from a catalogue of 503 barometric minima lower than 730 mm. (28.75 in.) published on the occasion of the Second Pan-Pacific Congress.

OVER THE WHOLE PACIFIC OCEAN.

660.39 mm. (25.99 in.) recorded on board S.S. F. H. Drews in the North PACIFIC OCEAN, Dec. 15, 1888.

PHILIPPINE ARCHIPELAGO, EASTERN SIDE.

690. mm. (27.165 in.) S.S. Basilan, in Frank Helin Bay
690.12 mm. (27.17 in.) S.S. Pathfinder, in San Policarpio Bay
Both recorded Sept. 25, 1925.

PHILIPPINE ARCHIPELAGO, WESTERN SIDE.

683. mm. (26.88 in.) S.S. Empire, in China Sea
Recorded Aug. 17, 1913.

These minima are taken from records taken between 1803 and 1925. They are the extreme values and not the usual thing. It is exceptional indeed when the barometer goes below 700 mm. (27.56 in.) in Fig. I, a barometric curve is given which shows how a low barometer can, but not always, be used to measure the intensity of the storm. The intensity depends, not so much on how low the barometer falls, but how fast it falls. The curve of Fig. I, was recorded in a very destructive typhoon and the curve shows why. If the barometer fell more gradually, the winds would not have been so violent. The temperature and humidity of the central area cause considerable thought for an explanation, at least these phenomena in one typhoon do, During the typhoon of Oct. 20, 1882 (the typhoon which caused the curve given on Fig. I), the continuous records of temperature and humidity recorded at the Manila Observatory showed conditions unthought of before that time. With so much moisture-laden air rushing toward the center, one would expect the air in the calm area to be rather moist, to say the least. Yet what was recorded? The humidity dropped from saturation to 43% (a value seldom observed in Manila at any time) while the temperature rose from 25° C. (77° F.) to 31.5° C. (88.7° F.) Where did this dry air come from? If not from the air near the surface of the earth, then from above must be the answer. What pulls (or pushes) it down? These are some of the questions raised by the data recorded at the Manila Observatory during that typhoon. They have not been answered to the satisfaction of meteorologists yet. Every theory concerning the nature of typhoons or hurricanes must take these data into account and the theory must explain them or it will be rejected. It is obvious that the Manila Observatory will have a part in the solution of this problem.

To conclude this article, a few narrations of some experiences during typhoons will be given. They are found on page 58 and 59 of Fr. Algue's book.

The Calcutta Cyclone of 1864, (from Handbook of Cyclonic Storms by Elliot). The Alexandra steam tug was at anchor off Saugor light house on the early morning of the 5th. At 4 a.m. the wind shifted suddenly to northeast, blowing in furious gusts, accompanied by pelting sleet and seas over all. On coming head to wind the engines were set going at full power; about 8 a.m. or 9 a.m. it became suddenly calm, with a heavy, confused sea, the sun appearing at the turn for a few minutes. The calm interval lasted about three-quarters of an hour - the steamer's head to wind and the engines doing their best. During the calm, being apparently in the vortex of the hurricane, several land birds were falling about the decks, some dead. At the end of the calm, a thick mist and heavy rollers seemed coming from northwest, accompanied by a moaning sound, which was immediately followed by a sudden blast from the northwest, throwing the steamer on her beam ends and burying her in a sheet of foam to the top of the funnel."

An account of the passage of the ship "Idaho" through the calm center in a hurricane in the China Sea, September 21, 1869. - "Suddenly the mercury rose (from 27.62 in. to 27.90 in.). and with one wild, unearthly, soul-thrilling shriek the wind as suddenly dropped to a calm, and those who had been in these seas before knew that we were in the terrible vortex of the typhoon, the dreaded center of the whirlwind.

Till then the sea had been beaten down by the wind, and only boarded the vessel when she became completely unmanageable, but now the waters, relieved from all restraint, rose in their own might. Ghastly gleams of lighting revealed them piled up on every side in rough, pyramidal masses, mountain high - the revolving circle of wind, which everywhere inclosed them, causing them to boil and tumble as though they were being stirred in some mighty cauldron. The ship, no longer blown over on her side, rolled and pitched, and was tossed about like a cork. The sea rose, toppled over and fell with crushing force upon her decks. Once she shipped immense bodies of water over both bows, both quarters, and the starboard gangway at the same moment. Her seams opened fore and aft. Both above and below, men were pitched about the decks and many of them were injured.

At twenty minutes before eight o'clock the vessel entered the vortex; at twenty minutes past nine o'clock it had passed and the hurricane returned, blowing with renewed violence from the north, veering to the west. The ship was now only an unmanageable wreck." Fr. Algue does not tell haw the boat reached harbor and other events which followed, but since some one was able to tell what happened, we can assume that the "unmanageable wreck" somehow or other survived the storm.

Mr. Bernard F. Doucette, S.J.
Weston College.

NEW QUANTITATIVE LABORATORY IS OPENED AT GEORGETOWN.

The beginning of the second semester marked the opening of a new Quantitative Laboratory in the Chemistry Department of Georgetown University. The construction of this laboratory was made necessary by the continually increasing number of students who have decided to take Chemistry for four years. The laboratory was built in the space formerly occupied by the Chemistry Office and private laboratory. It contains one hundred and seventeen lockers. A Barnstead Electric Still with a capacity of two gallons an hour has been installed. Other pieces of apparatus will be added as soon as the need arises.

The building of this laboratory was the cause of several other changes in the Chemistry Department. First, new offices had to be found - these are now located in the space formerly occupied by the Hoya offices

Secondly, a new small laboratory for postgraduate work was built in the room which was formerly used as an internal combustion engine instruction room during the World War. And thirdly in order to take care of the additional supplies for the new laboratory a renovation of the stock room which included more shelving space, a new ceiling and a complete painting was put into effect.

These changes practically complete a program of enlargement which was started about a year ago, and which has included opening of a new lecture room and increasing the seating capacity of the old lecture room from 95 to 150. The capacity of the Laboratories for General Chemistry was also increased by the addition of one hundred and thirty-two new lockers. This brings the total number of lockers in the General Laboratories to three hundred and ninety-six.

For the scholastic year 1927-1928 the number of students enrolled in the Chemistry courses totalled five hundred, and the number of members on the Chemical Staff totalled nine.

The Chemistry Club is also functioning regularly and lectures by outstanding men in the Chemical profession are given monthly. Last month Dr. Harrison E. Howe, Editor of Industrial and Engineering Chemistry gave a very interesting lecture on the new cellulose industry outlining the manufacture of artificial silks and kindred articles. Next month Dr. Hale, a member of the executive board of the National Research Council and the inventor of a new process for the manufacture of Phenol will address the Club members.

Mr. L. Gorman,
Georgetown University.

BIOLOGICAL NOTES.

I. The Marine Biological Laboratory at Woods Hole issues a catalogue of microscope slides which contains a clear and concise account of the methods of microtechnic Among other interesting points the article states that experiments carried on at the laboratory seem to show that the old statement "cooked tissues are worse than useless" is without foundation as both plant and animal tissues have been exposed to a temperature of 65 C in an oven for three days at the laboratory without any apparent harmful results. Heat the article holds cannot make the tissue more brittle as it is already as brittle as it can be after it has been thoroughly cleared in Xylol. The poor results formerly attributed to overheating and probably the result of poor infiltration or of sectioning with a dull knife.

II. A simple time saving method of transferring course material (such as sections of plant stems) from one reagent to another is to place them in a small piece of cheese cloth or mosquito netting and simply lift the netting out of one dish and place it in another. This is especially of advantage in taking sections out of stain where it is difficult to see them.

III. A few Hydra fusca and H. viridis were introduced into an aquarium and have now multiplied into hundreds of individuals. The H. viridis became much more numerous than the fusca and collected on the side nearest the light. The H. fusca were larger and distributed on each side. My doubts as to whether or not the hydra were used as food by the minnows present were settled by observation. A minnow slowly approached until it came in contact with a hydra and then suddenly backed away, evidently the nematocysts are an efficient protection against enemies much larger than the hydra in size.

Mr. C. Berger,
Loyola College.

THE GEORGETOWN CHEMO-MEDICAL INSTITUTE.

The public press recently announced that the Chemo-Medical Research Institute which Georgetown University is planning to found under the leadership of Fr. G. Coyle has received a gift of $250,000 from Mr. and Mrs T. J. Maloney of Waldwick N.J. Mr. Maloney is a retired business man and was formerly president of the American Tobacco Company. Fr. Coyle, the head of the department of Chemistry of the University, has given much time during the past few years to prepare plans for the new Institute and its work and to solicit funds for its building and endowment. It is stated that pledges totaling $2,500,000 have been given. Of this $300,000 have been paid. We congratulate Fr. Coyle on his success in this difficult pioneer enterprise. We feel confident that he will obtain the endowment of $4,000,000 he is seeking. In planning the Institute he is fortunate in being able to profit by the advice and suggestions of a committee composed of nine eminent members of the American Chemical Society in which he has held several important positions. The Institute will be located near the new Medical School west of N street between Thirty-sixth and Thirty-seventh Streets. This group with the large University Hospital to which a new wing has just been added will make Georgetown one of the most important medical centres in the country.

Fr. Coyle is quoted as saying: "In the recommendations of the scientific leaders of the American Chemical Society for a concentrated attack on disease, Georgetown recognizes a call to duty and to humanity, and to meet its obligations of national service to the present age and to generations yet unborn. It proposes to erect a chemical laboratory which, while supplying needed facilities for its arts and science schools, will at the same time contain a complete separate institute of chemo-medical research, equipped with all modern facilities of apparatus and materials. Here eminent specialists chosen only for their performance and stimulation of original investigations, free from the burdens of teaching and in the security of a comfortable living, can devote themselves to chemo-medical research in almost ideal conditions to the end that human suffering may be relieved. We are confronted with this high duty, since it is agreed that the nations must look to private institutions rather than to industrial or government laboratories to perform it.

In the investigation of its vital problems, the late war has taught us that amazing rapidity and successful results are best attained through the systematic cooperation of trained investigators in the various fields of science which bear on the problems under consideration-that the work of research is furthered by having these investigators housed under one roof where, by daily contact and conference, their united efforts will be most fruitful." Fr. Coyle further explains that the purpose of the institute will be to attack disease through obtaining a knowledge of its natural and fundamental causes. Latest Government statistics show that 48 per cent of all deaths are caused by five little understood forms of disease - tuberculosis, pneumonia, cancer, nephritis and heart disease. He said further "But death is only a part of the toll disease takes of ignorance. The question of vanquishing disease is of national economic importance. There is the personal poverty and misey entailed by illness and the immense lowering of efficiency in industrial production it involves. Three years ago our estimated drug bill was $500,000,000, indicating a growth of $100,000 per year, a tremendous tax on those least able to bear it." Emphasis is laid on the fact that Washington is the centre of a large number of Government laboratories engaged on a great variety of scientific problems. The new Institute will enjoy the advantages of clos contact with these specialists and make available for consultation their varied knowledge and experience. It will also be able to enlist the advice of distinguished foreign scientists who visit the nation's capital. The library facilities at Washington are of course well known.

PUBLICATIONS.

Publications 2,3,4 of Volume I of the Manila Observatory have recently appeared. No. I is an "Historical Survey of Our Knowledge of the Longitude and Latitude of Manila" by the director Fr. Selga. It is an interesting account of the various determinations that have been made of these important constants from the early days of the colony down to the present time with some description of the instruments and methods employed. There has of course been a great advance in precision with the improvement in astronomical methods and equipment. It is surprising however to note among Fr. Selga's conclusions that even 350 years ago the latitude of Manila was known to within six minutes of the best value available at present and that almost 200 years ago the value of the longitude was known to with five minutes of arc of the present value. No 3 is a discussion by Fr. Selga of "The Eclipse of the Sun of June 20, 1629 at Manila." The account occurs in a manuscript document entitled "Relacion de los sucesos de las Islas Filipinas y otros reinos vecinos desde el mes de julio de 1628 al mes de julio de 1629." The author of the account was a Jesuit but his name is unknown. He states, "On the twentieth of June, an eclipse of the sun began at eleven o'clock, and at thirteen minutes after twelve it was so far eclipsed, that it could not be seen at all. It seemed as if it were night and the stars were seen in the sky, so that we were forced to light candles in order to eat: for there was a dinner that afternoon, on the occasion of a certain feast. As far as I know this eclipse was not seen in Nueva Espana: it is the most complete one that I have ever seen, though I have seen many." Fr. Selga points out that eclipses belong to characteristic groups or families and that the date of another eclipse belonging to the same family can be computed from the Saros period. The most southern eclipse of the series occurred on December 13, 1917. "On account of its central line lying across the south pole, the eclipse was visible in all longitudes and at all hours of local time, at noon and at midnight, at sunrise and at sunset. Fr. Selga ends with these words: "I will finish this historical sketch by noting the coincidence of a Jesuit observing an eclipse in 1629 at Manila and of another Jesuit computing at Omaha, Nebraska, for the South Pole, the 16th recurrence of the same eclipse." He refers of course to Fr. Rigge whose results were published in Popular Astronomy, Vol. XXV, 1917 pp, 346.

Publication No. 4 is a report of the recent "Determination of the Longitude of the Manila Observatory by Wireless Telegraphy" by Fr. C. Deppermann. The author states that "the purpose of the work was three-fold: (a) to participate in very modest way with other observatories in the World Longitude Determination; (b) to obtain a value for the longitude of the Observatory itself more accurate than that previously used and to compare the value thus secured with the ones obtained by cable; (c) to test the accuracy of some of the usual ways of observing time signals." All the time determinations were made by Fr. Comellas using a Repsold Broken Transit. The instrument had an impersonal micrometer but the star transits were observed by tapping a key in the chronometer circuit. Three radio receiving sets for short medium and long waves were used for receiving the time signals. All the records were measured by Fr. Deppermann. As this was the first time that radio time signals were employed for the determination of longitude at Manila the quality of those received in this tropical region from various stations is of interest. Fr. Deppermann states; "Bordeaux (LY, 18900 m., 4 A.M. Manila Time) and Nauen (POZ, 18,000 m., 8 A.M.) were always heard but with much static. While listening for Nauen, Rugby in England (GBR, 18,750 m.) could be heard more loudly than Nauen. Honolulu (NPH, 11,500 m.) was never heard at 4:30 A.M. and 9 A.M.; At 6:30 P.M. if audible it was very weak and overwhelmed in static. Bordeaux could sometimes be heard at 4 P.M. and Nauen at 8 P.M. but very faintly. Saigon (HZA, 16,000 m., 7:30 P.M.) was very loud. Funabashi, Japan (7,700 m. 10 A.M.) was always weak and often lost. Hongkong (2000 m.) was very strong at 9 P.M. but much reduced in strength at 10 A.M. Malabar (PKX, 15,00 m., 9 A.M.) was very strong except when "blanketed" by Cavite.

As for the short wave signals, Honolulu (NPM, 36.8 m., 6:40 P.M.), d'Issy (ODCJ, 32 m., 4 A.M.) both came in quite faithfully, but the signal strenght varied remarkably at times. Bellevue (NKF) was only heard at 6:20 P.M. on 74.7 m., very faintly. Due to a defective coil the 24.9 m. signals were missed; but WIK (New Brunswick N.J.) on 22 m. was very distinct.

Comparison of Methods of Reception: "Undoubtly automatic registration is by far the best method, if at all possible: not only are the variations from the mean for a given set of signals less than in other methods, but the lag is capable of much more exact determination. If such registration is not possible, then for loud signals the method of tapping upon hearing a signal after a pause seems fully as good as the method of coincidences; for the fainter signals, the method of coincidences seems preferable." The value obtained for the longitude of the Observatory from Greenwich is 8 hours 3 minutes 54.712 ± 0.006 seconds East. This is 0.512 seconds greater than the value used up to that time. Mr. B. Doucette formerly of Manila and now at Weston College computed the correction to be applied due to finite time of propagation of radio waves. He also found the longitude difference between the Observatory time pole and the transit to be 0.128 seconds.

We are indebted to Fr. Tondorf for two interesting brochures describing two of our Spanish observatories. The first is "El Observatorio" by Fr. Puig, a well illustrated description of the Observatory of the Ebro at Tortosa of which Fr. Rodes is director, Fr. Puig is one of the staff. The other is a series of views commorating the 25th anniversary of the founding of the observatory de Cartuja. We hope to give an account of both in a later issue. Mr. Tynan who is in charge of the Seismological Station at Fordham University has sent us a copy of an interesting article by Fr. Sanchez Navarro originally published in "Iberica" and entitled "A ctual cooperacion de la Compania de Jesus a los estudios sismologicos." Fr. Navarro has also recently published in Razon y Fe a article La Estacion sismologio de Cartuja y su labor cientifica (1903 1928) this has appeared as a brochure.

In the Georgetown College Journal for April Fr Tondorf has an article with the title "A Geologists Resentment". It is a critique of an article on the "History of Geological Thought" contributed to the Johns Hopkins Medical Magazine by Professor E. B. Mathews of Johns Hopkins. While commending the outline of the origin and development of the science of geology the resentment shown to what is designated as "theology", "religion" or "superstition" as a hindrance to the advance of science is justly criticized.

The Science News Letter is a weekly summary of current science edited in Washington. We have already referred to some of its accounts of the scientific doings of Ours. The issue of April 7th is called the European travel number. Under the title of "Europe's Weather Stations" it mentions The Observatorio del Ebro at Tortosa a "large Jesuit Institution devoted especially to the study of relations between solar and terrestrial phenomena". Among astronomical observatories it mentions "The Vatican Observatory, operated for many years under the direction of Father J. C. Hagen S.J. formerly of Georgetown University Washington, and the leading authority of the world on variable stars". The issue of April 14th in an article on "Rambling around U.S. Observatories" gives a paragraph to the Georgetown Observatory.

The Technology Review, the organ of the Massachusetts Institute of Technology in its April number has an interesting article by Katharine Maynard, librarian of the Vail Collection in the Institute Library, on the invention of the balloon and the thrills of eighteenth Century ballooning as described in some of the books of the collection. The author states in the first paragraph that Francis Lana, a Jesuit, was the first person, according to all available records who designed an airship embodying asemblance of sound scientific theory. In the sixth chapter of his "Prodromo" published at Brescia in 1670 we find the earliest recognition of the lighter-than-air principle with full details of the design proposed. He intended to construct a vessel suspended from four spheres of thin copper, exhausted of air, which, owing to the difference between their weight and the weight of the displaced air, were calculated to sustain the additional weight of the boat. The Institute library possesses a copy of Lana's treatise.

The Hormone the "Chemical Messenger from the Chemists' Club of Holy Cross College is now in its second volume. It has proven very successfull and gives eloquent testimony of the high standing maintained by the department of Chemistry at Hol Cross under the direction of Fr. G. Strohaver. We note in the March number an article by Fr. Strohaver on "Protein Chemistry."

"Tycos" for April 1928 gives a half a page to the Fordham Seismological Station. It includes a snapshot of Mr. Tynan the director and also a picture of the observatory being moved to its new site on the northeast corner of the hill that overlooks the athletic field. An addition to the station has been built to house the new instruments which are coming from Esthonia. The Universe" an English Catholic newspaper reproduces two of the pictures in its issue of February 17th. The Sunday Rotogravure Section of the New York Herald-Tribune also had a portrait recently of Mr. Tynan engaged in studying a seismogram.

The Proceedings of the Sixth Annual Meeting of our Association were recently published by the Secretary Mr. T. Barry of Georgetown University. Doubtless all members have by this time received a copy.

Mr. Barry calls attention to the fact that the Catholic Sun of Syracuse for Feb. 9th had on its first page a portrait of Fr. Macelwane with the announcement that he had been appointed Dean of the Graduate School of St Louis University. He finds the list of Observatories listed in the British Nuatical Almanac for 1929 divided into two sections, the first of active observatories and the second of former ones. In the first list he has noted the following ones conducted by Ours: Creighton, Vatican, Santa Clara, Stonyhurst, Ebro, Valkenburg, Georgetown, Zo-Se, Kalosca, Granada, Manila and Tananarive (Madagascar). Of course the Vatican Observatory does not belong to the Society but has a Jesuit as its director. He states that "The Royal Observatory at the Roman College was on the second list, being active from 1776-1924. That is an item of interest since it is one of the places taken from us by the Italian Government".

NOTES.

Volume IV, No. 3, of the Bulletin p. 35 contained a note that the Boston agent of the Weston Electrical Instrument Corporation in a letter to the editor had stated that his company had withdrawn discounts from all schools except technical colleges. Father Gipprich of Georgetown University sends word that the department of Physics of which he is the head at the University still has the privilege of the discount. Any of our professors desiring Weston instruments may order them through him and receive the former discount.

Father Phillips of the Georgetown Observatory addressed the Associated Science Clubs of Goucher College in Baltimore on April 24th. His subject was "The Present State of Our Knowledge of Nebulae".

The Eastern Section of the Seismological Society of America held its third annual meeting at the University of Virginia at Charlottesville Virginia from April 30th to May 2d. Fr, Tondorf of Georgetown read two papers. The first was on "Lightning as an Accompaniment of Earthquakes" and the second "Some Data on the Earthquake of July 1927, in Palestine". This Jerusalem earthquake is one of fifty-seven quakes since the beginning of the Christian era and possibly the most destructive. The epicenter was located in the Valley of the Dead Sea.

The American Geophysical Union met in Washington on April 26th and 27th. Fr. Tondorf, by appointment of Dr. Washington chairman of the National Research Council, acted as Chairman of the Committee on Resolutions. He has also lectured on earthquakes to the Newcomers Club of Washington.

The Georgetown Hoya states that Fr. P. Carasig has recently returned from Cuba to Georgetown. Many will remember him as he made his theological studies at Woodstock where he was ordained.

He went to Cuba last October to study Meteorology at the Belen Observatory at Havana giving special attention to tropical hurricanes which are numerous in the Caribbean and which are much akin to the typhoons of the Philippines. He will continu his studies at Georgetown where he will be in touch with the officials of the United States Weather Bureau. The Hoya states that he will go to Europe to make final preparation for his work at the Manila Observatory.

THE AUGUST MEETING AT WOODSTOCK.

Fr. Phillips our president sends word to the Bulletin that according to word received from Reverend Father Provincial Fr. Kelly this years meeting of the Association will be held at Woodstock College. The date has not yet been settled as far as we know but it will doubtless be after the science summer school. We hope to give further details in the next issue of the Bulletin. Fr. Phillips urges all who can to prepare a paper and to send the title to the Secretary, Mr. T. D. Barry at Georgetown University, Washington D.C. It is important that all who expect to attend the meeting should inform Mr. Barry that arrangements can be made in good season for lodgings, etc. The Reverend Superiors at Woodstock will appreciate early and correct information concerning the number of those coming. It is hoped that as many as possible will journey to Woodstock and do their part to make the meeting a success. It will be our first meeting at the famous college which is the alma mater of most of our members. They will be able to renew old acquaintances and revisit old familiar scenes. Many too will have their first opportunity to see the new chapel and wings and also the new science quarters recently completed.